CLAIMS

Add A1

1. A strain sensor comprising: an optical waveguide (6) having a plurality of reflecting structures along its length, wherein each structure reflects light at a different characteristic wavelength (λ_1 to λ_{n+1}) which changes in dependence on a change of physical length of at least part of the reflecting structure; characterised in that the reflectivity of reflecting structures which reflect at characteristic wavelengths which are adjacent to each other (λ_1 and λ_2, λ_n and λ_{n+1}) are configured to be different such that the intensity of light reflected from adjacent structures can be used to discriminate between them.

2. A strain sensor according to Claim 1 in which the reflecting structures which reflect at adjacent wavelengths are configured such that one structure reflects light at one characteristic wavelength and the structure adjacent in wavelength is selected to reflect light at two characteristic wavelengths.

3. A strain sensor according to Claim 2 in which the reflecting structure which reflects light at two wavelengths is configured such that the two characteristic wavelengths are separated by at least the width of the reflection characteristic of the structure which reflects at the adjacent wavelength.

4. A strain sensor according to any preceding claim in which the optical waveguide (6) comprises an optical fibre.

5. A strain sensor according to any preceding claim in which the or each reflecting structure comprises a grating structure and wherein the change in characteristic wavelength is in consequence of a change in the pitch of the grating.

6. A strain sensor according to Claim 5 in which the or each grating structure comprises a Bragg grating.

7. A strain sensor according to Claim 5 or 6 when dependent on Claim 4 in which the optical fibre (6) includes a photo refractive dopant and the or each grating structure is optically written into the fibre.

8. A strain sensor according to Claim 7 in which the optical fibre comprises silica doped with germanium oxide.

9. Apparatus for measuring strain; comprising a sensor according to any preceding claim, a light source (2, 4) operable to apply light to the waveguide of the sensor, said light having a wavelength range which covers at least the range of wavelengths over which the reflecting structures reflect and detector means (10-16) for determining the change of characteristic wavelength at which the reflecting structures reflect light, said changes being indicative of a change in length of at least a part of the respective reflecting structure.

10. Apparatus for measuring strain according to Claim 9 in which the detector means determines the change in characteristic wavelength by measuring the

wavelengths at which the sensor reflects light.

11. Apparatus for measuring strain according to Claim 9 in which the detector means measures light transmitted by the sensor and determines the change in characteristic wavelength by measuring the changes in wavelength at which light transmission is attenuated.

12. Apparatus according to any one of Claims 9 to 11 in which the detector means further comprises means for utilising the relative magnitude of the intensity of reflected light or the relative magnitude of the intensity at which light transmission is attenuated to discriminate between reflecting structures which are adjacent in wavelength.

13. A method of measuring strain comprising; providing a sensor according to any one of Claims 1 to 8, applying light to the waveguide of the sensor, said light having a wavelength range which covers at least the range of wavelengths over which the reflecting structure reflects light, and detecting any change in the characteristic wavelength at which the reflecting structures reflect light.

14. A method according to Claim 13 comprising detecting the change in characteristic wavelength by measuring the wavelengths at which the sensor reflects light.

15. A method according to Claim 13 comprising detecting the change in

characteristic wavelength by measuring the wavelengths at which the transmission of light through the sensor is attenuated.

16. A method according to Claim 14 or Claim 15 and further comprising detecting the relative magnitude of the intensity of reflected light or the relative magnitude of the intensity at which transmitted light is attenuated to discriminate between reflecting structures which are adjacent in wavelength.

17. A method according to any one of Claims 13 to 16 and further comprising sweeping the wavelength of the light applied to the sensor.

18. A method according to any one of Claims 13 to 17 in which, when it is desired to measure strain within an object, further comprises securing a part of the waveguide having at least a part of one of the reflecting structures to the object such that a change in the physical length of at least a part of the object causes a change in the physical length of at least a part of the reflecting structure.

19. A method according to any one of Claims 13 to 17 in which, when it is desired to measure the temperature of an object, further comprises placing a part of the waveguide having at least a part of one of the reflecting structures in thermal contact with the object such that a change in the temperature of the object causes a change in the physical length of at least a part of the reflecting structure.